

CLAIMS

1. An automated semiconductor tape and reel changing method comprising:
 - 5 providing a tape and reel handler;
 - mounting a plurality of receiving reels onto a shaft of an automated reel changer;
 - 10 positioning a first receiving reel of the plurality of receiving reels at a position on the shaft to receive a first carrier tape from the tape and reel handler;
 - 15 receiving the first carrier tape from the tape and reel handler into a receiving opening of the automated reel changer and responsively grasping a first end of the first carrier tape;
 - inserting the first end of the first carrier tape into the first receiving reel then releasing the first end;
 - 20 rotating the first receiving reel at a first rate while winding the first carrier tape onto the first receiving reel;
 - 25 moving a securing device to contact a second end of the first carrier tape and responsively attaching the securing device to the second end of the first carrier tape after the first carrier tape is wound onto the first receiving reel;
 - stopping rotation of the first receiving reel after attaching the securing device; and
 - 30 removing the first receiving reel from the shaft while moving a second receiving reel of the plurality of receiving reels to the position to receive a second carrier tape from the tape and reel handler.

2. The method of claim 1 wherein inserting the first end of the first carrier tape into the first receiving reel then releasing the first end includes rotating the first end of the first carrier tape toward the first 5 receiving reel until the first end is inserted into a slot in the first receiving reel.

3. The method of claim 1 wherein receiving the first carrier tape from the tape and reel handler into the 10 receiving opening of the automated reel changer and responsively grasping the first end of the first carrier tape includes detecting the first end and responsively grasping the first end.

15 4. The method of claim 3 wherein detecting the first end and responsively grasping the first end includes moving a detector into a path of the first end and detecting the first end as the first end moves near the detector.

20 5. The method of claim 4 wherein detecting the first end and responsively grasping the first end includes activating a pneumatic cylinder to slide the detector into a path of the first end.

25 6. The method of claim 1 wherein moving the securing device to contact the second end of the first carrier tape and responsively attaching the securing device to the second end of the first carrier tape includes moving a 30 pressure roller into contact with the first carrier tape that is wound onto the first receiving reel.

7. The method of claim 1 wherein moving the securing device to contact the second end of the first carrier tape and responsively attaching the securing device to the second end of the first carrier tape includes stopping the 5 rotation of the first receiving reel, moving the securing device into contact with the first carrier tape, and re-activating rotation of the first receiving reel.

8. The method of claim 7 wherein stopping the 10 rotation of the first receiving reel, moving the securing device into contact with the first carrier tape, and re-activating rotation of the first receiving reel includes moving an adhesive tape into contact with the first carrier tape.

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9. The method of claim 8 wherein stopping the rotation of the first receiving reel, moving the securing device into contact with the first carrier tape, and re-activating rotation of the first receiving reel includes 20 cutting a first length of the adhesive tape and winding the first length of the adhesive tape onto the first carrier tape.

10. The method of claim 1 wherein removing the first 25 receiving reel from the shaft while moving the second receiving reel of the plurality of receiving reels to the position includes sliding the second receiving reel along the shaft and pushing the first receiving reel off of the shaft.

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11. The method of claim 10 wherein sliding the second receiving reel along the shaft includes turning a positioning screw with a motor to slide the second receiving reel.

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12. A method of forming an automated semiconductor tape and reel changer comprising:

5 forming a rotationally driven reel shaft having a length sufficient to receive a plurality of receiving reels;

10 forming a loader module to receive a first carrier tape and responsively insert a first end of the first carrier tape into a first receiving reel of the plurality of receiving reels;

15 forming a securing module to contact the first receiving reel, attach a securing device, and disengage from the first receiving reel; and

15 forming a reel positioner to eject the first receiving reel from the rotationally driven reel shaft and position a second receiving reel of the plurality of receiving reels to receive another carrier tape from the loader module.

20 13. The method of claim 12 wherein forming the loader module to receive the first carrier tape and responsively insert the first end of the first carrier tape into the first receiving reel of the plurality of receiving reels includes forming a rotationally driven receiving chamber to receive the first carrier tape, and insert the first carrier tape into the first receiving reel.

30 14. The method of claim 12 wherein forming the rotationally driven receiving chamber to receive the first carrier tape, and insert the first carrier tape into the first receiving reel includes attaching the receiving chamber to a pivot arm that rotates around a shaft.

15. The method of claim 14 further including attaching a drive motor to the shaft.

16. The method of claim 12 wherein forming the securing module to contact the first receiving reel, attach the securing device, and disengage from the first receiving reel includes coupling a motor to a drive screw 5 and coupling the drive screw to the securing module.

17. The method of claim 12 wherein forming the securing module to contact the first receiving reel, attach the securing device, and disengage from the first 10 receiving reel includes attaching a cutting device to the securing module to perforate the securing device, and attaching a counting device to the securing module.

18. The method of claim 12 wherein forming the reel 15 positioner to eject the first receiving reel includes slidingly attaching a plate to the rotationally driven reel shaft and coupling a positioning screw to slidingly move the plate along the rotationally reel driven shaft.

19. An automated semiconductor tape and reel changer comprising:

- 5 a loader module having a loader arm suitable for rotating about a pivot point of the loader arm and having a head assembly attached to a first end of the loader arm;
- 10 a rotationally driven reel shaft positioned perpendicular to an arc circumscribed by rotation of the loader arm, the rotationally driven reel shaft having a length sufficient for receiving a plurality of receiving reels wherein an end of the rotationally driven reel shaft is distal from the arc;
- 15 a reel positioner slidably attached to the rotationally driven reel shaft between the end of the rotationally driven reel shaft and the arc; and
- 20 a securing module slidably positioned radially to a circle circumscribed by rotational motion of the rotationally driven reel shaft.

20. The automated semiconductor tape and reel changer of claim 19 wherein the securing module includes a drive screw coupled to slide the securing module to the plurality of receiving reels and away from the plurality of receiving reels.